Department of Energy Seminar "Emerging Challenges for Chemical Security"

Risk Based Decision Making: The Near Miss Dilemma

March 16, 2006

The Impact of Management Decisions

- Close or Keep Running
- Cut costs to reduce losses
  - Reduce experienced personnel
  - Cut maintenance of critical equipment
  - Cut upkeep of redundant safety systems
- Do not investigate release that killed 4 in November

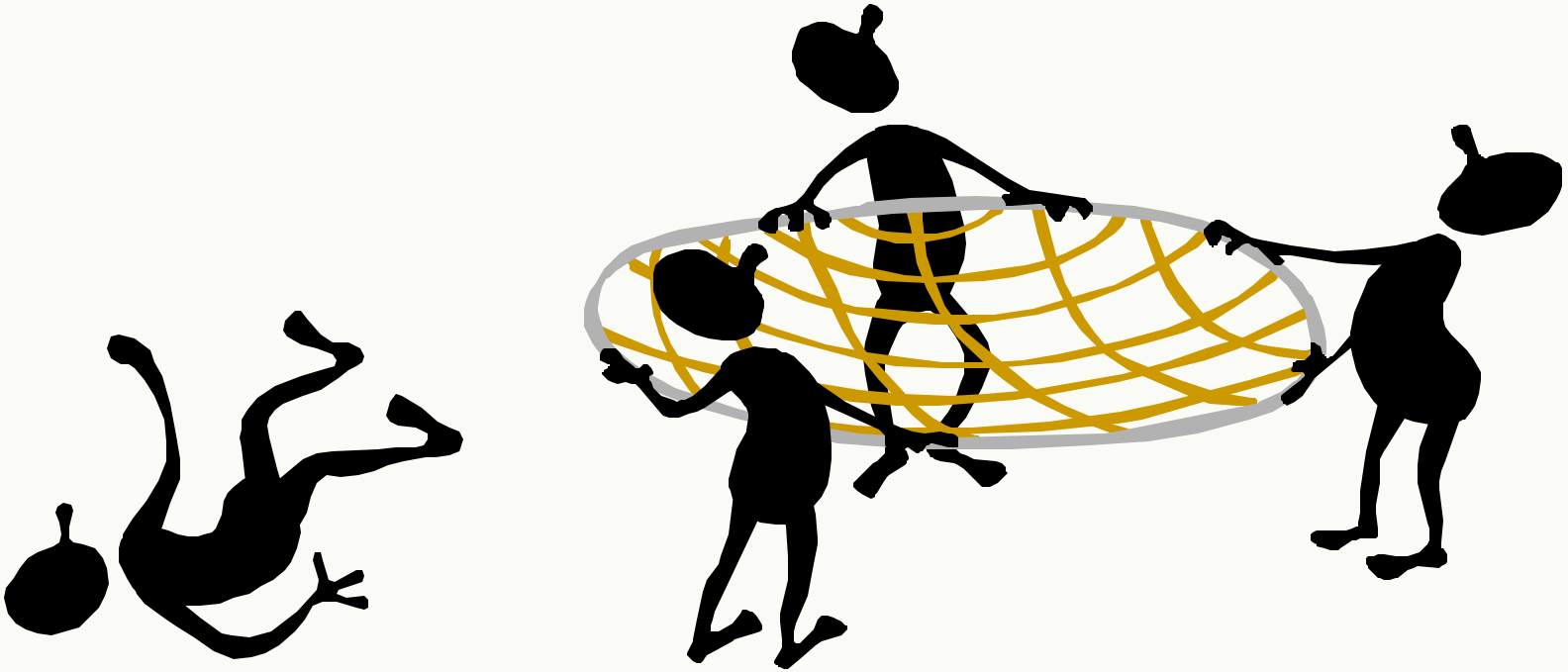
Bhopal India, December 1984

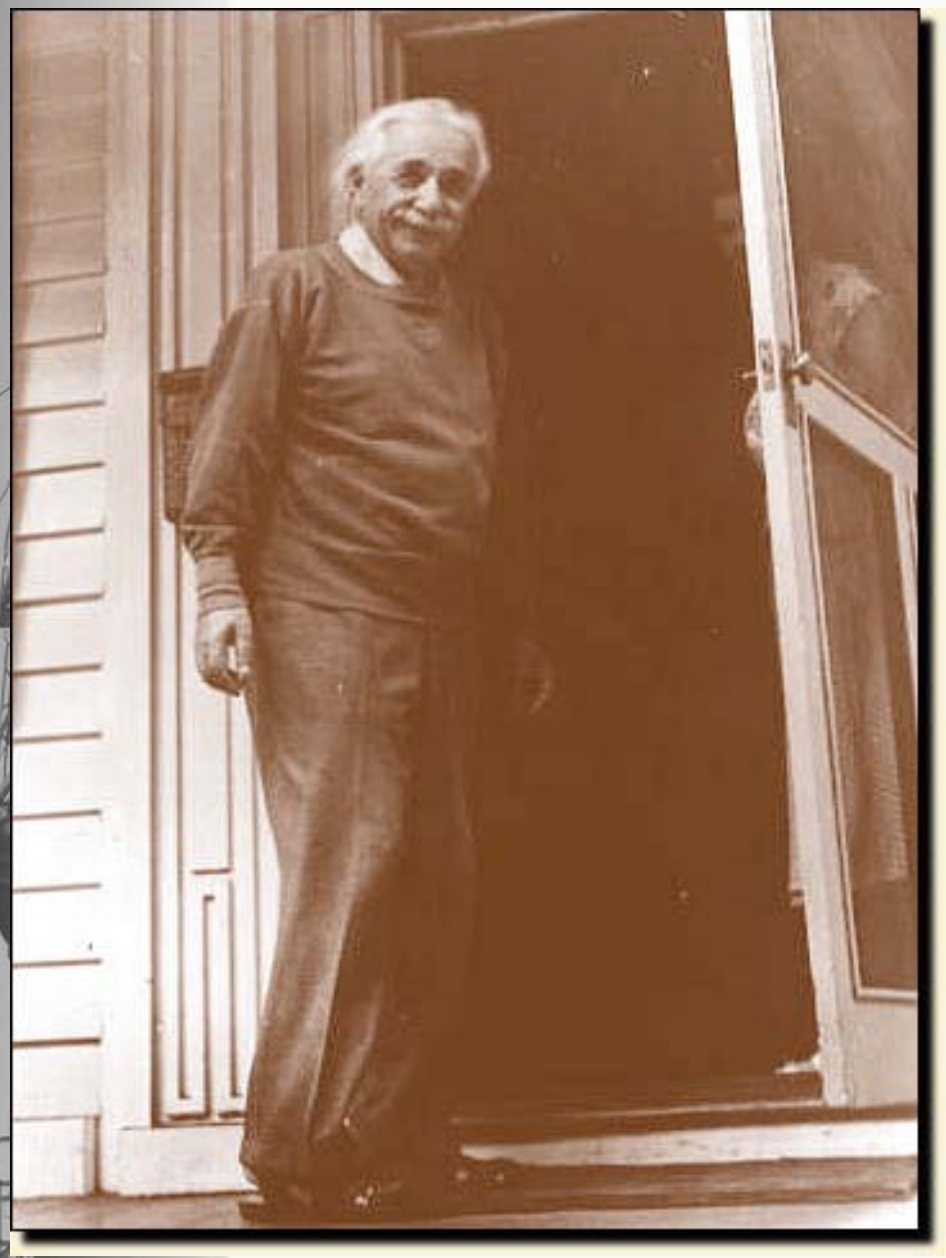
CSB Investigation Findings

- Every accident was preceded by near misses that were ignored or not investigated
- Management cries, ” If I had only known!”

What is a “near miss”?

- For the difference of one condition, an event is either an abnormal disturbance or a catastrophe!





- ***Albert Einstein said: "You only see what you know."***

  Near miss events are like little lamps lighting the way to a hazards that we cannot see for the darkness of ignorance or inattention. Once illuminated it is up to you to remove it or fall victim to its awful potential.

Accident Prevention Must Begin With Abnormal Situation Recognition!

What does accident prevention depend upon?

- *Hazard Recognition*
- *Engineering and Design*
- *Management Systems*
- *Human Factors*

And management risk based decision making

Murphy's Law Has Not Been Repealed!

Really BIG accidents are just waiting for the little ones to get out of the way…..

Phenolic Resin Dust Explosion

- Dust Removal Equipment Ineffective
- Dust Collected Overhead, Everywhere
- MSDS information poor
- Workers Unaware of Dust Explosion Hazard
- Oven Fires Common
- Oven Maintenance Delayed


7 Killed and 37 Injured

Ethylene Oxide Explosion

- Failure to communicate hazard
- Failure to install explosion prevention devices
- Safety device override possible


January 16, 2003
USA

NASA Shuttles All Had Tile Losses

- “Normal Abnormality”
- Never resulted in bad consequences
- Management did not want to hear of risk
- No preparations to address problems in flight
- No rescue plan
- Engineering and Safety concerns ignored

CSB Common Findings

- Failure to investigate or correct near misses
- Lack of technical expertise
- Failure to recognize potential hazards
- Lack of proper engineering and design
- Lack of maintenance of production systems
- Failure to maintain safety systems
- Lack of procedures or training for emergencies
- Failure to plan for emergency response
- Failure to prepare community for emergency
- Lack of regulatory or enforcement agency rigor

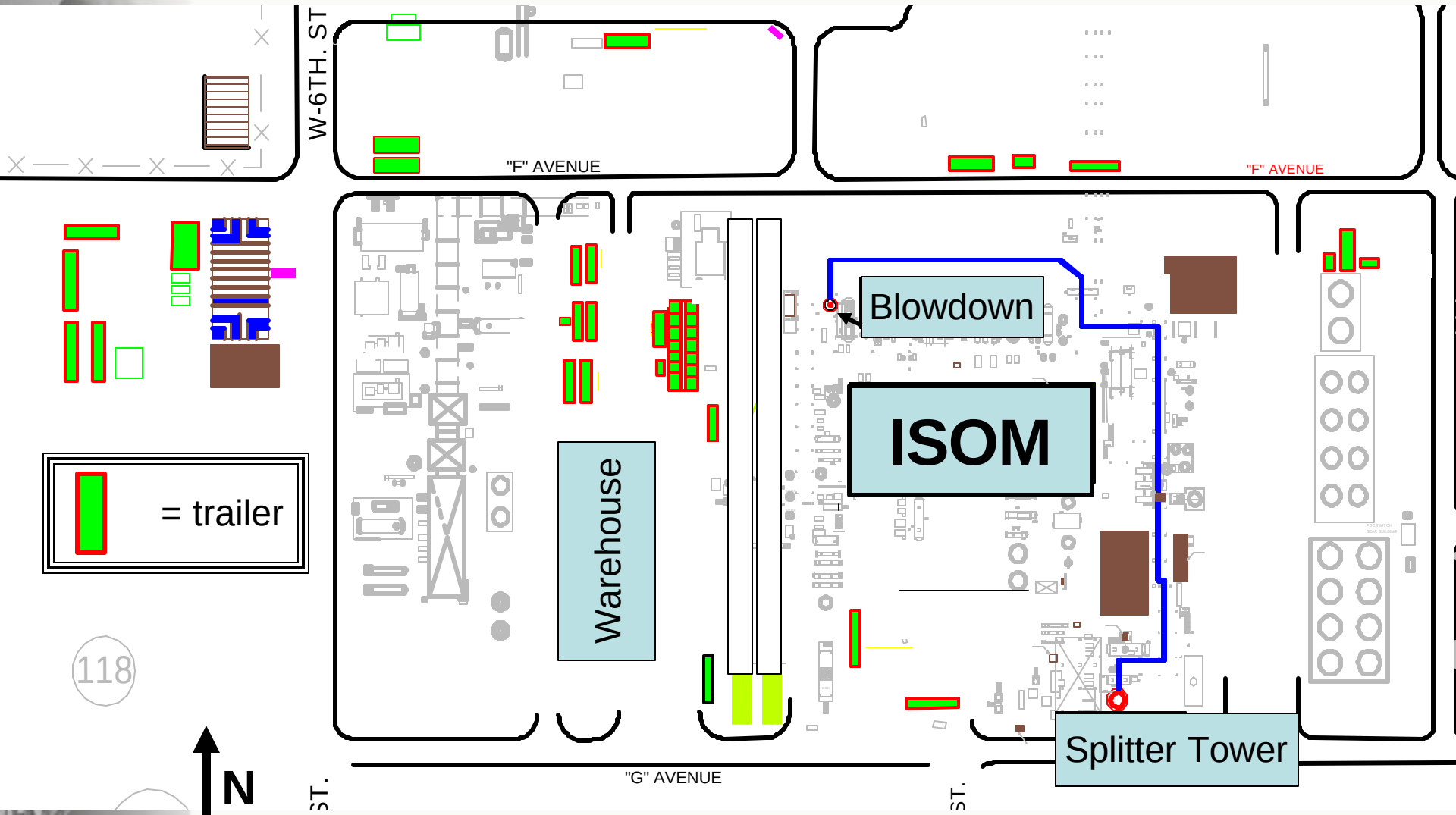
An incident that makes you wonder, "How far *have* we come?"

March 23, 2005
Texas City Refinery Explosion and Fire

Incident Summary

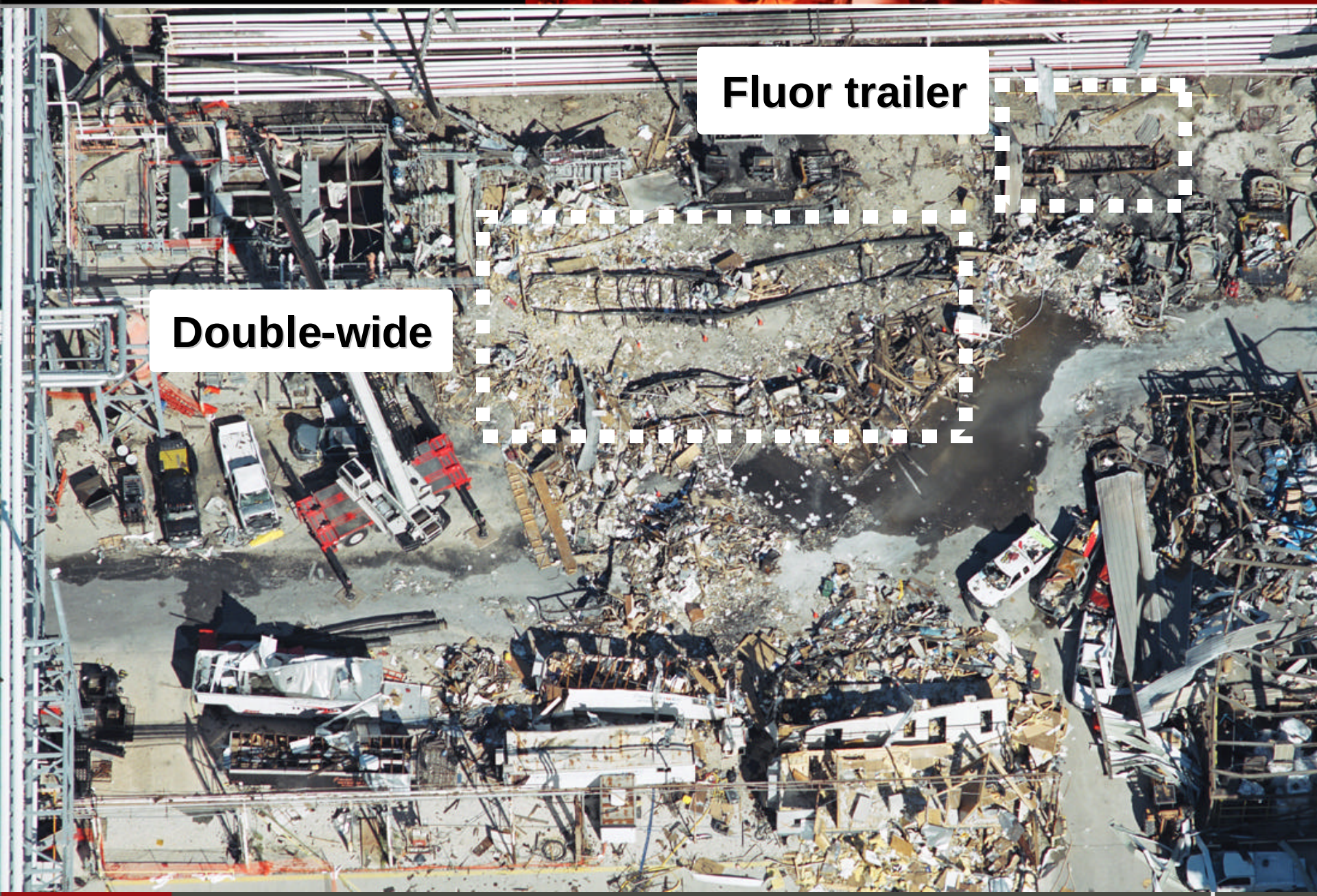
- Flammable vapor cloud, explosions, fire, and toxic release
- 15 deaths
- 170 injuries
- Offsite property damage and injuries

ISOM Unit, Blow Down Drum, Trailer Locations

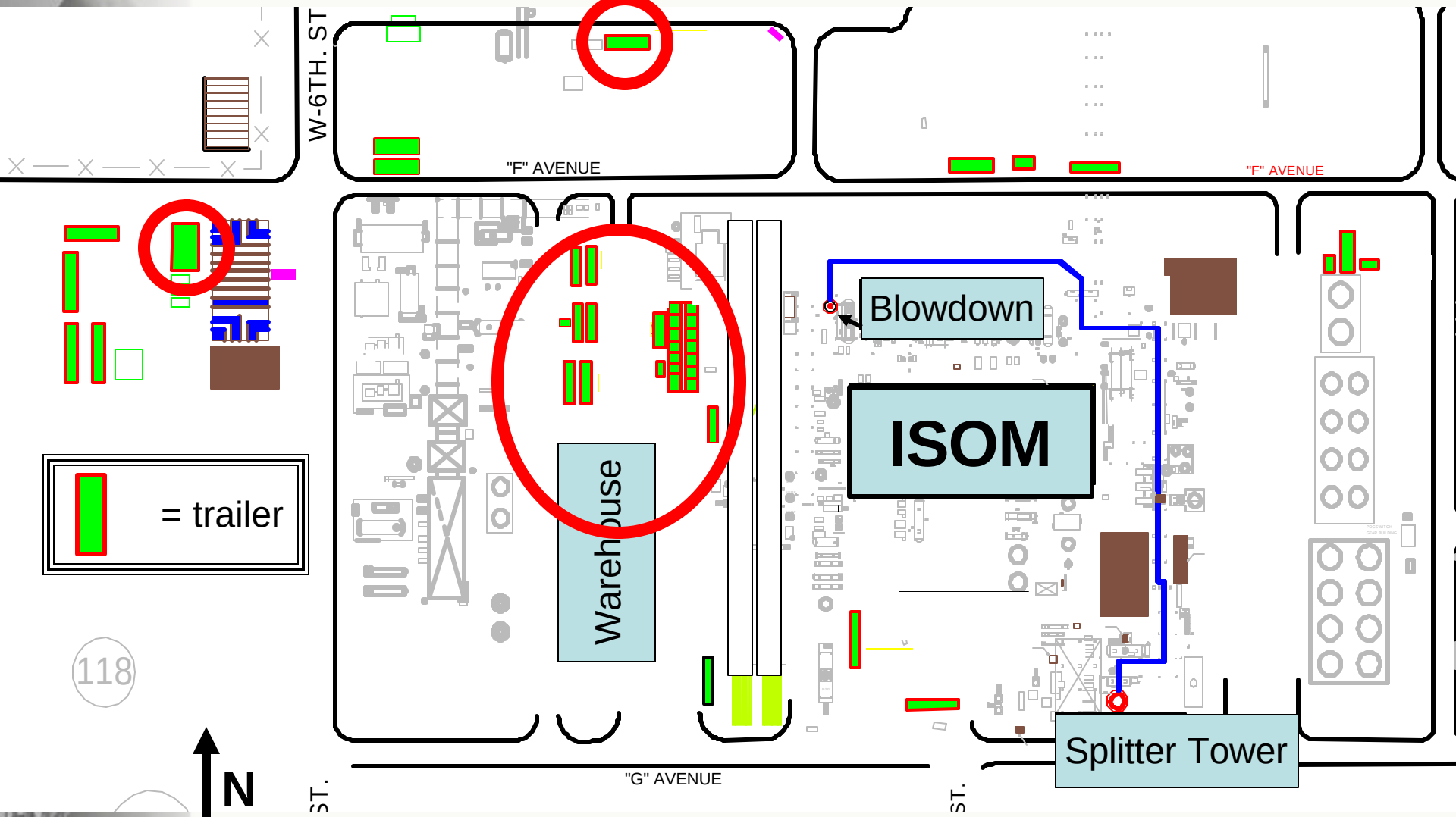


Incident Summary

- Splitter Tower overfilled and overpressured
- Blowdown drum overfilled and relieved to atmosphere
- Vapor cloud ignited
- Occupied trailers nearby destroyed

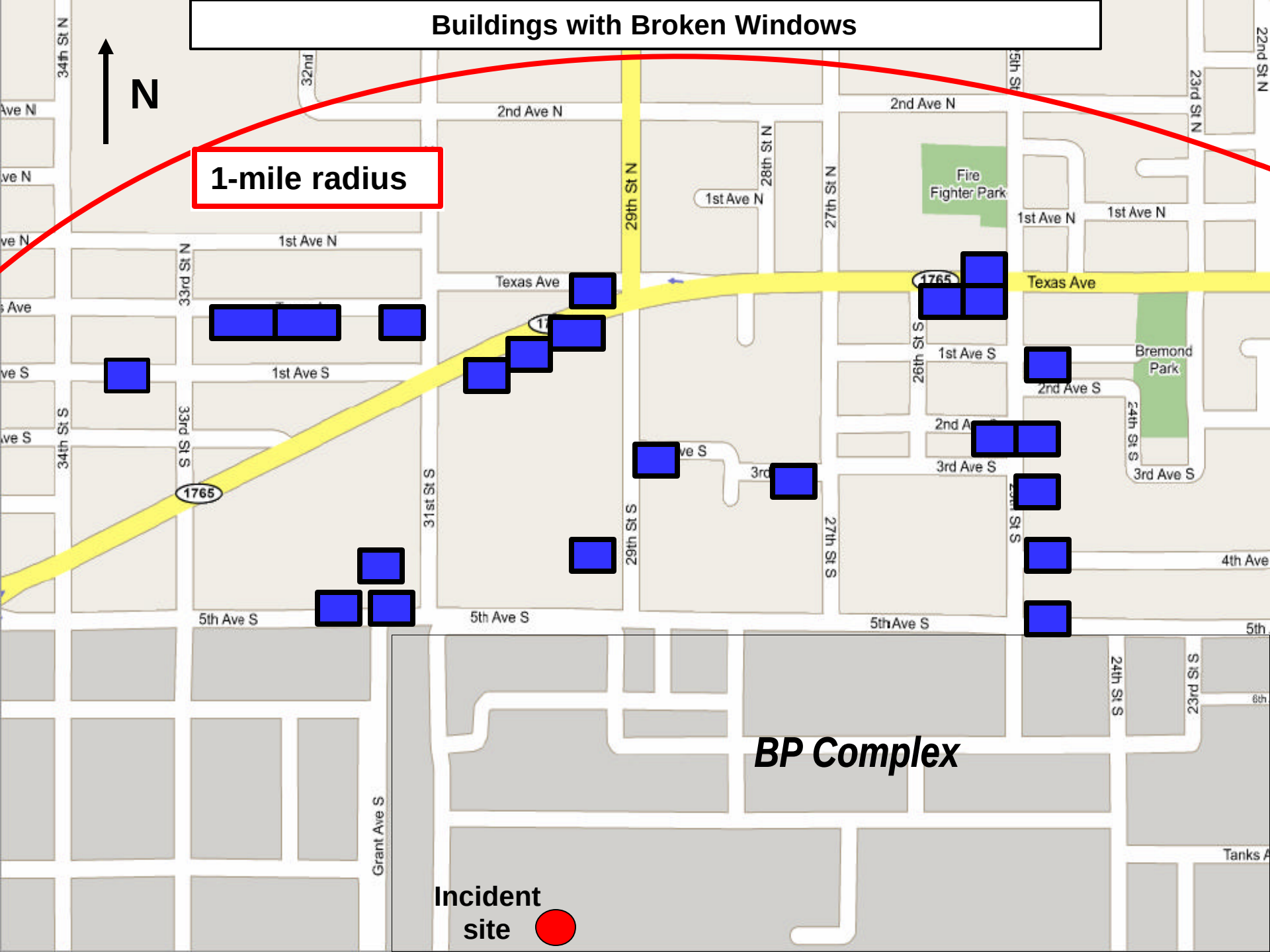

Fluor trailer
Double-wide

Damage to Trailers Distant from the ISOM



Damaged trailer 290 feet from explosion

Damaged trailer 600 feet from explosion


Buildings with Broken Windows
N
1-mile radius
2nd Ave N
1st Ave N
Texas Ave
1765
29th St N
28th St N
27th St N
33rd St N
1st Ave S
2nd Ave S
3rd Ave S
5th Ave S
34th St S
33rd St S
31st St S
29th St S
27th St S
26th St S
24th St S
Fire Fighter Park
Bremond Park
4th Ave
BP Complex
Grant Ave S
Incident site

Key Safety Issues

- Raffinate splitter tower had history of abnormal startups but none was investigated or cause corrected
- Between 1995 and incident, four serious releases of flammable material from the ISOM blowdown drum and stack occurred
- In 1992, OSHA cited a similar drum and stack at Texas City as unsafe. Citation dropped and drum not connected to flare

Key Safety Issues

Occupied trailers placed too close to a process unit handling highly hazardous materials

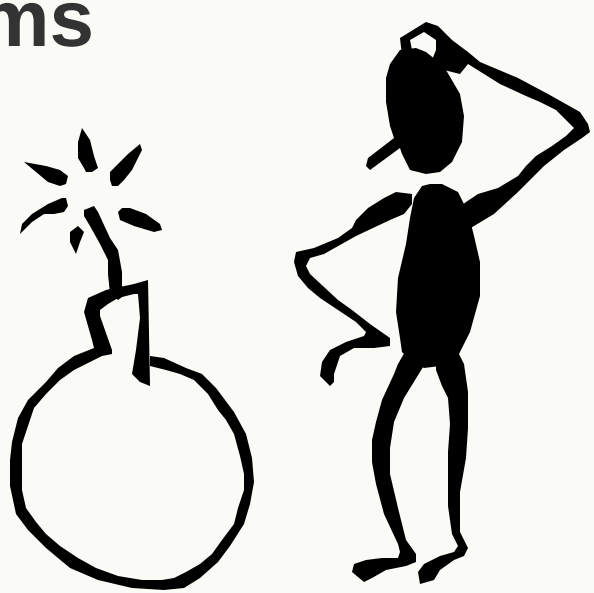
Vehicular Traffic policy allowed access to hazardous operations areas

ISOM unit started up with existing malfunctioning level indicator, level alarm, and control valve

Risk Based Decision Making!

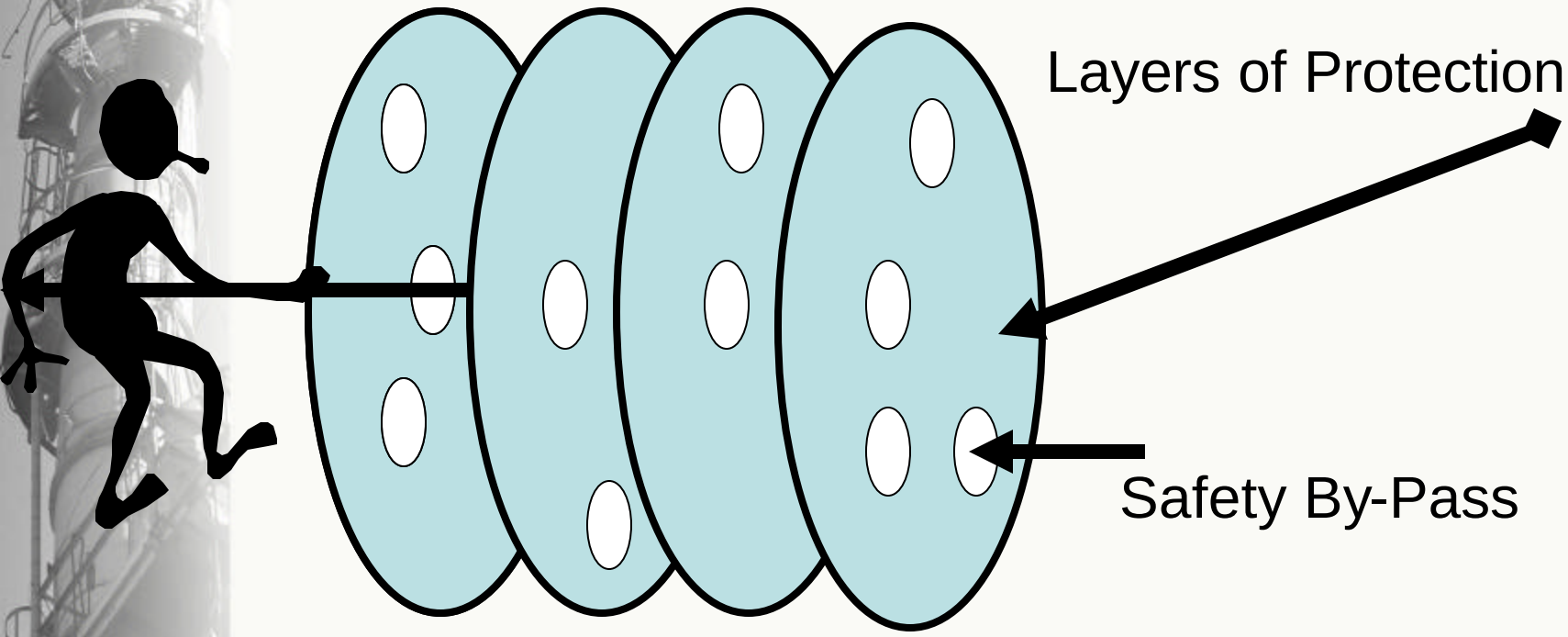
Preventing Accidents

- Hazard Recognition
- Design and Engineering
- Management Systems
- Human Factors
- Safety Culture



Near Miss? or a Hear Hit!

- **Think about the impending accident as a game of chance. Every hazard increases the odds of a hit. Layers of protection prevent the hit. Safety bypasses make holes in the protection.**



The Role of Chance in RBD!

- Flip a coin 10 times
  - H, H, H, H, T, H, H, H, H….
- Bet on next flip. What do you bet on?
- What about T, T, T, T, T? What would you bet on this pattern?
- ***There is no pattern!***
  - Chances are always 50/50 but humans believe in existence of nonrandom patterns.

Unless the "Near Miss" is taken as a warning of *bad things* to come, studies indicate it can actually *encourage* risky behavior because of our bent toward probability pattern recognition.

Predisposition to taking risk

- " We have always done it that way and never had any trouble."
- "That procedure is too strict. I never follow it and never had any trouble."
- "That alarm is set too sensitive so I generally ignore it. Never had any trouble"
- " The 'pops' never amounted to anything so we just figured they were normal. Never caused any serious trouble before."

“Dust explosion prevention device proposals rejected 65% of the time. Budgetary constraints given as main reason.

Some have actually said that the risk of two explosions in the same equipment at same facility is unlikely. “

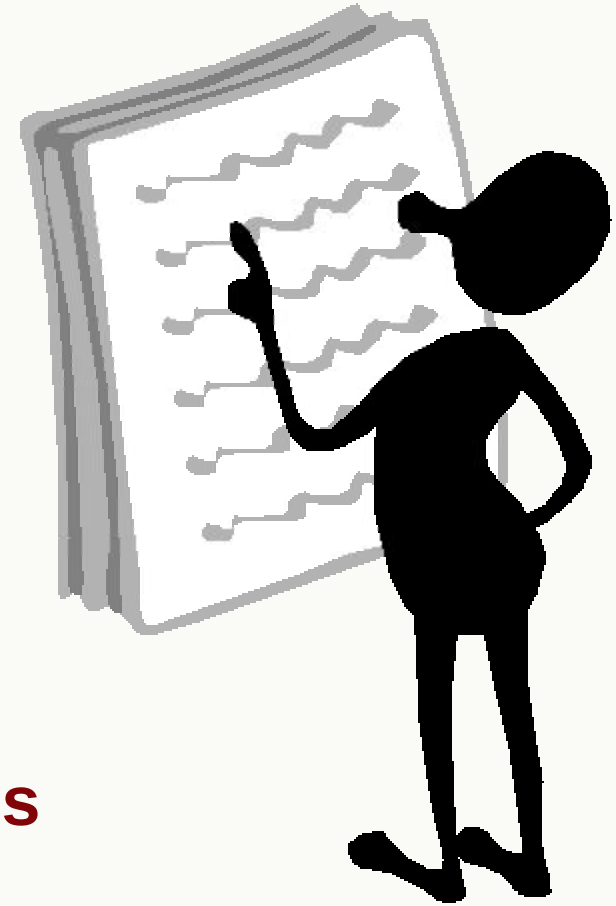
Testimony given at June 22, 2005 CSB Dust Hearing Washington, DC

Near Hit Investigations Missing

- CSB Common Finding: Warning events that were not investigated or corrected
  - Equipment/Design Failures
  - Process Leaks and Fires
  - Odor or Vapor release events
  - Warning alarms ignored/deactivated
  - Pressure or relief valves actuate
  - Operational mistakes
  - Work permit procedures not followed
  - Personal Protective Equipment

Documentation Found Warning of Hazards

- Audit findings
- Letters to management
- Safety Committee reports
- Requests to safety officers
- Uncompleted work orders
- Projects delayed repeatedly
- Budget proposals
- Insurance requests
- Engineering recommendations
- Vendor recommendations



What does this have to do with “Emerging challenges for chemical security”?

Learning From Katrina

Levy Vulnerability Was Known

Impact of Levy Failure Predicted

Impact on city population was calculated

Will this be a symbol of unsuccessful planning?

2004 Evacuation of Hurricane Isaac

Are we prepared for a chemical accident or criminal act?

- CSB experience - most investigations find significant deficiencies in emergency response
- Emergency responders do not communicate or coordinate effectively during an event
- Preplanning to protect the public and public emergency notification is inadequate
- Public does not know what to do

What Questions Are Asked After a Disaster?

- What planning was done for the risks that existed?
- Who was responsible for planning for evacuation and its execution?
- Was there a working, tested notification process to warn the public? Why Not?
- Why were the FD, Police, Facility, Public not prepared?

Leads to a lot of finger pointing!

Challenge in Chemical Security is planning to PROTECT THE PEOPLE!

Do You Have A Learning Organization?

Leadership is:

Predictive

Preventive

Proactive

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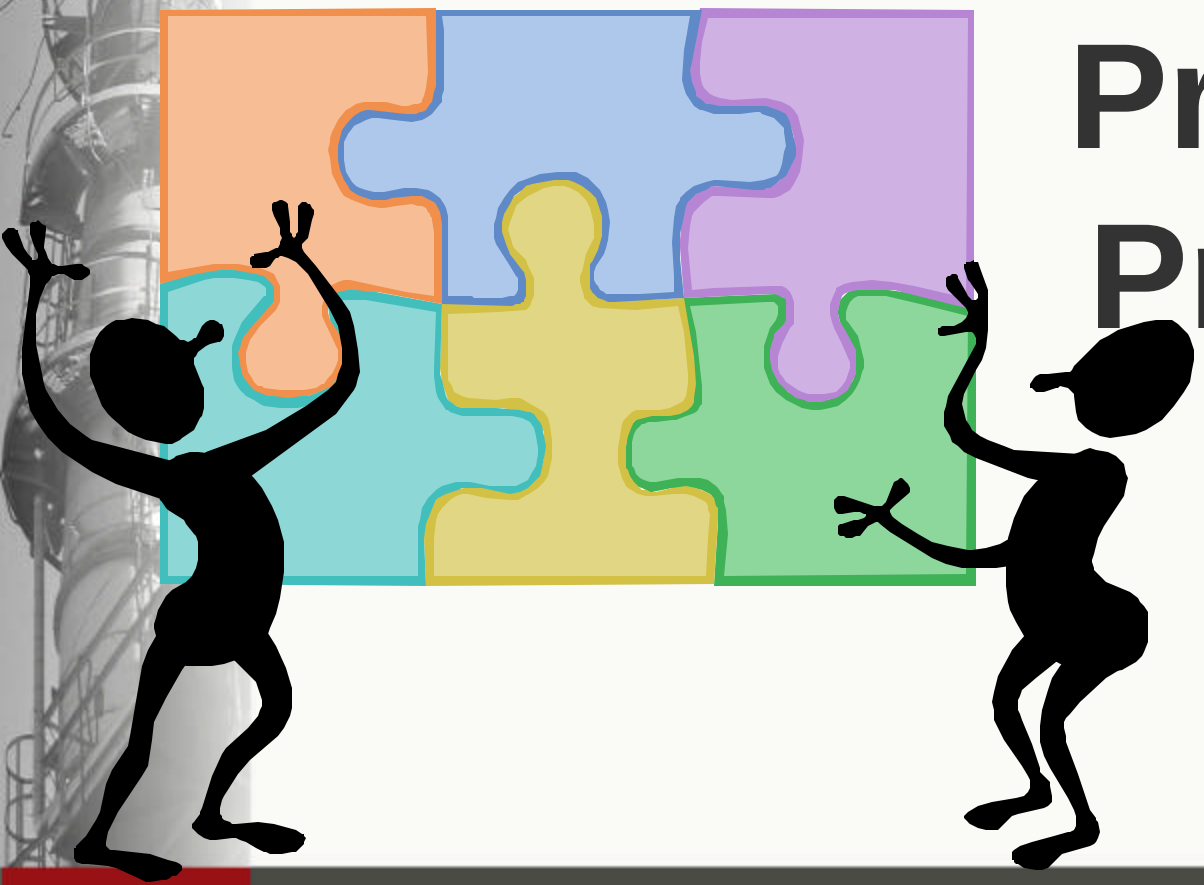
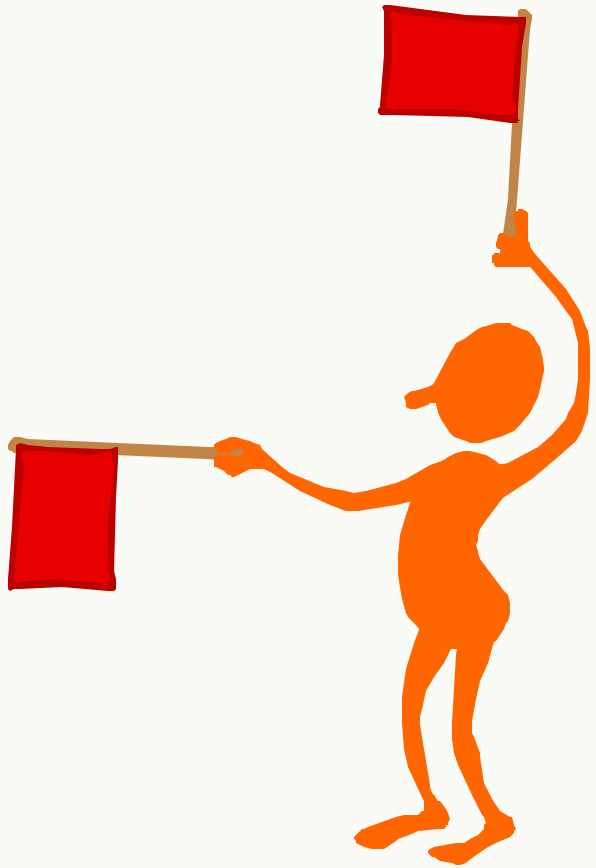


Planning in this phase of an emergency is too late

Contact Us!

- WWW.CSB.gov
- Automail sign up
- Download materials
- Attend CSB public meetings
- Visit K Street office



Disclaimer: This presentation given by Carolyn Merritt, Chair and CEO of the United States Chemical Safety and Hazard Investigation Board on March 16, 2006 to the **Department of Energy Seminar "Emerging Challenges for Chemical Security"** Washington DC for general informational purposes only. The presentation is the view of Ms. Merritt. References, conclusions or other statements about current CSB investigations may be **preliminary** and may **not** represent a formal, adopted product or position of the **entire** Board. For information on completed investigations, please refer to the final printed version on the CSB website at

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